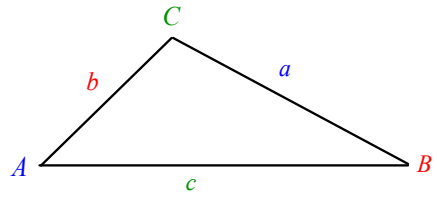
In non-right triangles we cannot use the primary trigonometric ratio; there is no 90° angle, so there is no hypotenuse!

However, there still exists relationships between the sides and the angles in the triangle.

The relationships can be expressed in terms of sine or cosine and are called the Sine Law and the Cosine Law.

We will study these laws over the next few days.

L7(8.1) - The Sine Law



The Sine Law (2 formats) for Δ ABC:

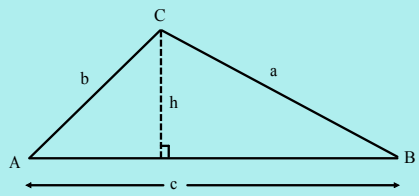
$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$ ① solve angles

or

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$ ② solve sides

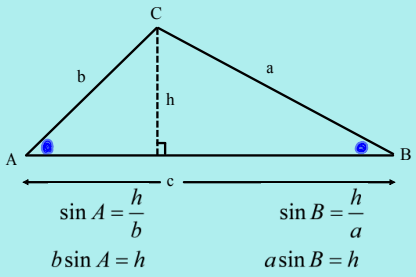
You decide which format to use depending on what you are solving for.

Proving the Sine Law:



We can always create right triangles by drawing an altitude from any vertex.

Using trigonometry on each right triangle, we can relate the angles and sides of the overall triangle.



$$\sin A = \frac{h}{b} \qquad \sin B = \frac{h}{a}$$

$$b\sin A = h \qquad a\sin B = h$$

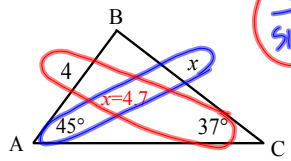
$$set \quad h = h$$

$$b\sin A = a\sin B$$

$$\frac{b\sin A}{a} = \sin B$$

$$\frac{\sin A}{a} = \frac{\sin B}{b}$$

Ex.1 Solve for x.



$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

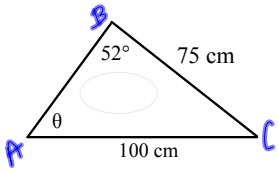
$\frac{a}{\sin A} = \frac{c}{\sin C}$

$\sin 45^\circ \cdot \frac{x}{\sin 45^\circ} = \frac{4}{\sin 37^\circ} \cdot \sin 45^\circ$

$\therefore$ side x is 4.7 units $\quad x = \frac{4\sin 45^\circ}{\sin 37^\circ}$

$x \doteq 4.7$

Ex. 2 Solve for θ.



$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$

$75 \cdot \frac{\sin\theta}{75} = \frac{\sin 52^\circ}{100} \cdot 75$

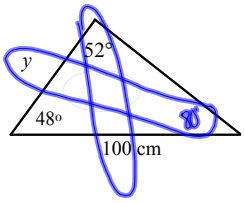
$\therefore \angle A$ is 36°

$\sin\theta = \frac{75\sin 52^\circ}{100}$

$\theta = \sin^{-1}\left(\frac{75\sin 52}{100}\right)$

$\theta \doteq 36^\circ$

Ex. 3 Solve for y.



$\frac{y}{\sin 80^\circ} = \frac{100}{\sin 52^\circ}$

$y = \frac{100\sin 80^\circ}{\sin 52^\circ}$

$y \doteq 124.97$

Assigned Work:

p.427 # 2ac
p.432 # 2, 3ace, 5ac, 6, 14, 15